

**TRANSMITTAL OF APPEAL BRIEF (Large Entity)**Docket No.  
**96B035/2**In Re Application **SUPPORTED LATE TRANSITION METAL CATALYST SYSTEMS**Serial No.  
**08/877,684**Filing Date  
**June 17, 1997**Examiner  
**James W. Pasterczyk**Group Art Unit  
**1755**Invention: **SUPPORTED LATE TRANSITION METAL CATALYST SYSTEMS****TO THE COMMISSIONER FOR PATENTS:**

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on

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*Signature*Dated: **May 4, 2004**

**Catherine L. Bell**  
**Registration No. 35,444**  
**ExxonMobil Chemical Company**  
**P. O. Box 2149**  
**Baytown, Texas 77522-2149**  
**Ph: 281-834-5982 / Fax: 281-834-2495**  
**Express Mail Label: EV 385527424 US**

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Appeal Brief  
Before  
Board of Patent Appeals and Interferences  
In the  
United States Patent & Trademark Office

In re:

U.S. Serial Number: 08/877,684  
Filed: June 17, 1997  
Inventors: George A. Vaughan, Jo Ann M. Canich, Phillip T.  
Matsunaga, David Gindelberger, Timothy D. Shaffer,  
Kevin R. Squire  
Title: SUPPORTED LATE TRANSITION METAL  
CATALYST SYSTEMS

## TABLE OF CONTENTS

I	Real Party in Interest	1
II	Related Appeals and Interferences	1
III	Status of Claims	1
IV	Status of Amendments	2
V	Summary of Invention	2
VI	Issues	3
VII	Grouping of Claims	4
VIII	Arguments	4
	Arguments in response to Issue 1	4
	Arguments in response to Issue 2	5
	Arguments in response to Issue 3	8
IX	Appendix A - Claims on Appeal	11

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**APPEAL BRIEF SUBMITTED UNDER 37 C.F.R. § 1.192**

**I. REAL PARTY IN INTEREST**

The real party in interest in this appeal is ExxonMobil Chemical Patents, Inc.

**II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences.

**III. STATUS OF THE CLAIMS**

Claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 stand rejected.

Claims 1-12, 14-16, 21-29, 31, 32, 34, 37, 38, 67-69, 75-98, 100-102, and 117-120 have been cancelled.

The rejection of claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 is appealed.

**IV. STATUS OF THE AMENDMENTS**

Applicants amendment dated March 16, 2004 has been entered.

There are no other amendments that have not been entered.

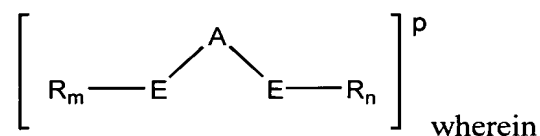
**V. SUMMARY OF THE INVENTION**

The present invention as claimed is directed to a catalyst system comprising a Group 9, 10 or 11 metal complex stabilized by a bidentate ligand immobilized on a support where the transition metal loading is less than 100 micromoles transition metal per gram of solid support. Specifically, Applicant's claimed invention relates to a transition metal catalyst

system for olefin polymerization comprising: I) a transition metal compound represented by the formula:

$LMX_r$  wherein:

- (a) M is a Group 9, 10 or 11 metal;
- (b) L is a bidentate ligand defined by the formula:



- (i) A is a bridging group containing a Group 13-15 element;
  - (ii) each E is independently a Group 15 or 16 element covalently bonded to M;
  - (iii) each R is independently a  $C_1$ - $C_{30}$  radical or diradical group which is a hydrocarbyl, substituted hydrocarbyl, halocarbyl, substituted halocarbyl, hydrocarbyl-substituted organometalloid, or halocarbyl-substituted organometalloid;
  - (iv) m and n are independently 1 or 2; and
  - (v) p is the charge on the bidentate ligand such that the overall charge of  $LMX_r$  is neutral;
- (c) each X is, independently, a hydride radical, a hydrocarbyl radical, a substituted hydrocarbyl radical, a halocarbyl radical, a substituted halocarbyl radical, hydrocarbyl-substituted organometalloid or halocarbyl-substituted organometalloid; a neutral hydrocarbyl-containing donor ligand; a univalent anionic ligand; a neutral non-hydrocarbyl atom containing donor ligand; or two Xs are joined and bound to the metal atom to form a metallacycle ring containing from about 2 to about 20 carbon atoms; or two Xs are joined to form an anionic chelating ligand; and
- (d) r is 1, 2 or 3;
- II) an activator; and

III) a solid support wherein said transition metal compound is immobilized on said support, where the transition metal loading is less than 100 micromoles transition metal per gram of solid support.

The description of Applicants' catalyst system is found at page 2, line 21 to page 3, line 3 of the specification.

## **VI. ISSUES ON APPEAL**

The issues on appeal are:

1. Whether the catalyst system described in claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 is anticipated under 35 U.S.C. § 102(e) by US 5,866,663 (Brookhart).
2. Whether the catalyst system described in claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 is obvious under 35 U.S.C. § 103(a) over US 5,866,663 (Brookhart).
3. Whether the catalyst system described in claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 is obvious over US 5,866,663 (Brookhart) in view of J. Am. Chem. Soc. Vol 117, No.23, pp.6414-6415 (1995) ("Johnson").

## **VII. GROUPING OF CLAIMS**

Claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, and 103-117 stand together.

## **VIII. ARGUMENT**

The art relied upon in the rejection of the claims under appeal is listed below:

1. US 5,866,663 (Brookhart); and
2. J. Am. Chem. Soc. Vol 117, No.23, pp.6414-6415 (1995) ("Johnson").

Argument in Response to Issue 1.

Claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 are rejected as anticipated under 35 U.S.C. § 102(e) by US 5,866,663 (Brookhart).

As stated in MPEP § 2131, "...a claim is anticipated only if each and every element as set forth in a claim is found, either expressly or inherently described in a single prior art reference." Verdegaal Bros. V. Union Oil Co. of California, 2 USPQ2d 1051,1053 (Fed. Cir. 1987)." As discussed below Brookhardt does not disclose each and every element set forth in the claims under appeal.

Among other things, Applicant's claimed invention requires "...the transition metal loading is less than 100 micromoles transition metal per gram of solid support." In paragraph 9 of the Office Action dated April 11, 2000 (Paper 16), the Examiner admits that "*Brookhart lacks teaching of the amount of metal compound on the support* compared as micromoles per gram support." (emphasis added) Furthermore nothing within Brookhardt inherently discloses such. The only supported example in Brookhardt (example 98) presents a loading of 122 micromoles of palladium pre gram of silica. (10 weight% loading of {[ (2,6-i-PrPh)<sub>2</sub>DABMe<sub>2</sub>]PdCH<sub>2</sub>CH<sub>2</sub>C(O)CH<sub>3</sub>]SbF<sub>6</sub><sup>-</sup>, where the molecular weight of the activated catalyst is 817.90).

This transition metal loading feature is important in Applicant's claimed invention. Brookhardt's loading of about 122 micromoles produced a "gummy" polymer having a broad molecular weight distribution. Applicant's loading of less than 100 micromoles produces a narrow molecular weight distribution polymer that is not gummy. Nothing within the four corners of Brookhardt discloses that lower loading levels will produce non-gummy polymers.

In view of the facts that the Examiner has admitted that Brookhardt does not disclose the amounts of metal on the support and there is nothing within Brookhardt that inherently discloses this specific limitation, Applicant submits that each and every element of the claimed invention is not disclosed in Brookhardt and that the rejection under 35 U.S.C. § 102(e) should be withdrawn.

Argument in Response to Issue 2.

Claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 are rejected as obvious under 35 U.S.C. § 103(a) over US 5,866,663 (Brookhart).

As stated in MPEP § 2141, the criteria set out in Graham v. John Deere (383 US 1, 148 USPQ 459(1966)) are used to assess obviousness. These are "...the scope and content of the prior art are to be determined, differences between the prior art and the claims at issue are to be ascertained and the level of ordinary skill in the pertinent art resolved."

The scope and content of the prior art: Brookhardt discloses various di-imine catalyst compounds that can be activated to polymerize ethylene. Column 51, line 51 et seq. suggests traditional supports such as a silica can be used as non-coordinating counter ions. Example 98 discloses a specific di-imine, [(2,6-i-PrPh)<sub>2</sub>DABMe<sub>2</sub>] PdCH<sub>2</sub>CH<sub>2</sub>C(O)CH<sub>3</sub>], activated with SbF<sub>6</sub><sup>-</sup> loaded onto silica at 122 micromoles per gram that produces gummy, broad molecular weight distribution polymer. Example 97 discloses the same catalyst and activator without silica polymerizing ethylene under similar circumstances to produce a polymer having a much higher molecular weight that is not gummy. Table 1 compares Examples 97 and 98.

Table 1

	Example 97	Example 98
Catalyst	[(2,6-i-PrPh) <sub>2</sub> DABMe <sub>2</sub> ] PdCH <sub>2</sub> CH <sub>2</sub> C(O)CH <sub>3</sub>	[(2,6-i-PrPh) <sub>2</sub> DABMe <sub>2</sub> ] PdCH <sub>2</sub> CH <sub>2</sub> C(O)CH <sub>3</sub>
Activator	SbF <sub>6</sub> <sup>-</sup>	SbF <sub>6</sub> <sup>-</sup>
Catalyst/ Activator amount	49 mg (0.058mmol)	0.53 g (0.063mmol)
Reactor	600 ml Parr autoclave under nitrogen	600 ml Parr autoclave under nitrogen
Solvent	30 ml of dry, deareated hexane	40 ml of dry, deareated hexane
Pressure	5.9MPa ethylene	5.5MPa ethylene
Time	16 hours	14 hours
Temperature	23°C	23°C
Polymer produced	Polyethylene	Polyethylene
Description	Spongy, nontacky, rubbery	Gummy, rubbery
Mw	347,000	118,000
Mn	149,000	6,900
Mw/Mn	2.33	17.08

The differences between the prior art and the claims at issue: Applicants claimed invention as a whole relates to a catalyst system comprising a catalyst compound, an activator, and a support where the transition metal of the catalyst compound is present at the very specific amount of less than 100 micromoles transition metal per gram of solid support. In paragraph 9 of the Office Action dated April 11, 2000 (Paper 16), the Examiner admits that "*Brookhart lacks teaching of the amount of metal compound on the support* compared as micromoles per gram support." (emphasis added).

The level of ordinary skill in the pertinent art: With regard to the level of skill in the art, it has long been established that catalysis is generally considered unpredictable merely from the chemical nature of the catalyst. Corona Co. V. Dovan (USSC 1928) 276 US 358, 369. Catalytic effects are not ordinarily predictable with certainty. In re Doumani et al. (CCPA 1960) 281 F.2d 215, 126 USPQ 408.

Turning now to the Examiner's position that Applicant's supported catalyst system that must have very specific amount of less than 100 micromoles transition metal per gram of solid support is obvious from Brookhardt, we note that repeatedly, over the course of the instant prosecution, Examiner has rejected Claim 13 as being obvious over Brookhart, even though Examiner has repeatedly admitted that Brookhart does not disclose the amount of metal compound on the support. In support of these rejections, Examiner has announced that varying the amount of metal on the support is within the skill of the art:

- i) depending on how active he wanted the supported catalyst to be;
- ii) by cost, since the metals of the prior art are expensive;
- iii) depending on the surface area of the support; and
- iv) based on the amount of reactivity to be achieved and the cost of the metals.

These statements are broad overgeneralizations that trivialize the extremely difficult and unpredictable art of organic catalysis. As noted above, the courts have long recognized that catalysis is an unpredictable art and such broad overgeneralizations are not sufficient support for rejections under 35 U.S.C. § 102 or 35 U.S.C. § 103. Furthermore, MPEP § 2141 states that the references cited in support of a § 103 rejection must "...be considered as a whole,...must suggest the desirability and the obviousness of making the combination, and

must be viewed without the benefit of impermissible hindsight...." When Brookhardt is viewed as a whole, nothing suggests that supported catalysts with low metal loadings are desirable. Further it would not be obvious to do so because catalysis is inherently unpredictable and no one of ordinary skill in the art could have predicted with a "reasonable expectation of success" (as required in MPEP § 2141) that a supported catalyst with low metal loadings would have polymerized at all, much less that it would produce polymers significantly different from those in Brookhardt. Brookhardt's polymers in examples 97 and 98 are rubbers. Applicants polymers have melting points near 90°C and above, which indicates a significantly higher level of crystallinity, such that the polymers are thermoplastics *not rubbers*. This is completely unexpected from examples 97 and 98 which Brookhardt says make rubbers. It is only with the forbidden tool of hindsight reconstruction that one can take Brookhardt, which does not discuss metal loading levels at all, and announce that Applicant's claimed invention is obvious because varying the amount of metal on the support is within the skill of the art...because (choose one):

- i) depending on how active he wanted the supported catalyst to be;
- ii) by cost, since the metals of the prior art are expensive;
- iii) depending on the surface area of the support; and
- iv) based on the amount of reactivity to be achieved and the cost of the metals.

Therefore, since nothing within Brookhardt discloses Applicant's claimed supported catalyst systems with loadings of 100 micromoles per gram of support or less and nothing within Brookhardt presents a reasonable expectation that Applicant's supported catalyst system can successfully produce non-gummy polymers, Applicant respectfully submits that the claimed invention is not obvious over Brookhardt under 35 USC § 103(a). Applicant submits that the rejection under 35 U.S.C. § 103(a) should be withdrawn.

#### Argument in Response to Issue 3.

Claims 13, 17-20, 30, 33, 35, 36, 39-66, 70-74, 99, 103-117 are rejected as obvious under 35 U.S.C. § 103(a) over US 5,866,663 (Brookhart) in view of J. Am. Chem. Soc. Vol 117, No.23, pp.6414-6415 (1995) ("Johnson").

As stated in MPEP § 2141, the criteria set out in Graham v. John Deere (383 US 1, 148 USPQ 459(1966)) are used to assess obviousness. These are "...the scope and content of the prior art are to be determined, differences between the prior art and the claims at issue are to be ascertained and the level of ordinary skill in the pertinent art resolved."

The scope and content of the prior art: Brookhardt discloses various di-imine catalyst compounds that can be activated to polymerize ethylene. Column 51, line 51 et seq. suggests traditional supports such as a silica can be used as non-coordinating counter ions. Example 98 discloses a specific di-imine, [(2,6-i-PrPh)<sub>2</sub>DABMe<sub>2</sub>] PdCh<sub>2</sub>Ch<sub>2</sub>C(O)CH<sub>3</sub>], activated with SbF<sub>6</sub><sup>-</sup> loaded onto silica at 122 micromoles per gram that produces gummy, broad molecular weight distribution polymer. Example 97 discloses the same catalyst and activator without silica polymerizing ethylene under similar circumstances to produce a polymer having a much higher molecular weight that is not gummy. Table 1 compares Examples 97 and 98.

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Catalyst	[(2,6-i-PrPh) <sub>2</sub> DABMe <sub>2</sub> ] PdCh <sub>2</sub> Ch <sub>2</sub> C(O)CH <sub>3</sub>	[(2,6-i-PrPh) <sub>2</sub> DABMe <sub>2</sub> ] PdCh <sub>2</sub> Ch <sub>2</sub> C(O)CH <sub>3</sub>
Activator	SbF <sub>6</sub> <sup>-</sup>	SbF <sub>6</sub> <sup>-</sup>
Catalyst/ Activator amount	49 mg (0.058mmol)	0.53 g (0.063mmol)
Reactor	600 ml Parr autoclave under nitrogen	600 ml Parr autoclave under nitrogen
Solvent	30 ml of dry, deareated hexane	40 ml of dry, deareated hexane
Pressure	5.9MPa ethylene	5.5MPa ethylene
Time	16 hours	14 hours
Temperature	23°C	23°C
Polymer produced	Polyethylene	Polyethylene
Description	Spongy, nontacky, rubbery	Gummy, rubbery
Mw	347,000	118,000
Mn	149,000	6,900
Mw/Mn	2.33	17.08

Johnson discloses di-imine catalysts that are used in solution to polymerize ethylene. Johnson does not disclose supports.

The differences between the prior art and the claims at issue: Applicants claimed invention as a whole relates to a catalyst system comprising a catalyst compound, an activator, and a support where the transition metal of the catalyst compound is present at the very specific amount of less than 100 micromoles transition metal per gram of solid support. In paragraph 9 of the Office Action dated April 11, 2000 (Paper 16), the Examiner admits that “*Brookhart lacks teaching of the amount of metal compound on the support* compared as micromoles per gram support.” (emphasis added). Likewise, the Examiner also admits that Johnson does not disclose supports. It naturally follows that if Johnson does not disclose supports, then Johnson also does not disclose certain specific levels of metal loading on supports.

The level of ordinary skill in the pertinent art: With regard to the level of skill in the art, it has long been established that catalysis is generally considered unpredictable merely from the chemical nature of the catalyst. Corona Co. V. Dovan (USSC 1928) 276 US 358, 369. Catalytic effects are not ordinarily predictable with certainty. In re Doumani et al. (CCPA 1960) 281 F.2d 215, 126 USPQ 408.

Turning now to the Examiner's position that Applicant's supported catalyst system that must have very specific amount of less than 100 micromoles transition metal per gram of solid support is obvious from Brookhardt in view of Johnson we note that Johnson does not disclose supports, so it is impossible for Johnson to fill the gap admitted by the Examiner of “...*Brookhart lacks teaching of the amount of metal compound on the support* compared as micromoles per gram support.” The combination of the two references simply does not produce Applicant's claimed invention. Johnson does not even mention supports and both references “...*lack teaching of the amount of metal compound on the support.*”

Therefore, since 1) nothing within Brookhardt discloses Applicant's claimed supported catalyst systems with loadings of 100 micromoles per gram of support or less; 2) nothing within Brookhardt presents a reasonable expectation that Applicant's supported catalyst system can successfully produce non-gummy polymers; and 3) nothing within Johnson discloses or suggests supports, much less specific loading levels, Applicant respectfully submits that the claimed invention is not obvious over Brookhardt in view of

Johnson under 35 USC § 103(a). Applicant submits that the rejection under 35 U.S.C. § 103(a) should be withdrawn.

Prayer

Applicant respectfully requests that the rejections under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) be withdrawn.

Respectfully submitted,

May 4, 2004  
Date

Catherine L. Bell  
Catherine L. Bell  
Registration No. 35,444

ExxonMobil Chemical Company  
Law Technology  
P.O. Box 2149  
Baytown, Texas 77522-2149  
(281) 834-5982 Voice  
(281) 834-2495 Facsimile

# **IX. APPENDIX : Listing of Claims:**

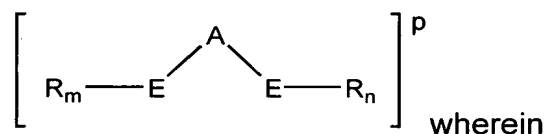
Claims 1 -12 are cancelled.

13. (Previously Presented) A transition metal catalyst system for olefin polymerization comprising:

l) a transition metal compound represented by the formula:

$LMX_r$ , wherein:

- (a) M is a Group 9, 10 or 11 metal;
- (b) L is a bidentate ligand defined by the formula:



- (vi) A is a bridging group containing a Group 13-15 element;
- (vii) each E is independently a Group 15 or 16 element covalently bonded to M;
- (viii) each R is independently a  $C_1$ - $C_{30}$  radical or diradical group which is a hydrocarbyl, substituted hydrocarbyl, halocarbyl, substituted halocarbyl, hydrocarbyl-substituted organometalloid, or halocarbyl-substituted organometalloid;
- (ix) m and n are independently 1 or 2; and
- (x) p is the charge on the bidentate ligand such that the overall charge of  $LMX_r$  is neutral;
- (c) each X is, independently, a hydride radical, a hydrocarbyl radical, a substituted hydrocarbyl radical, a halocarbyl radical, a substituted halocarbyl radical, hydrocarbyl-substituted organometalloid or halocarbyl-substituted organometalloid; a neutral hydrocarbyl-containing donor ligand; a univalent anionic ligand; a neutral non-hydrocarbyl atom containing donor ligand;

or two Xs are joined and bound to the metal atom to form a metallacycle ring containing from about 2 to about 20 carbon atoms; or two Xs are joined to form an anionic chelating ligand; and

- (d) r is 1, 2 or 3;
- II) an activator; and
- III) a solid support wherein said transition metal compound is immobilized on said support, where the transition metal loading is less than 100 micromoles transition metal per gram of solid support.

Claims 14-16 are cancelled.

- 17. (Previously Presented) The catalyst system of claim 13 wherein said activator comprises an alkylalumoxane, a modified alkylalumoxane, an aluminum alkyl, an aluminum alkyl halide, an aluminum halide, an ionizing anion precursor compound and/or a noncoordinating anion precursor.
- 18. (Previously Presented) The catalyst system of claim 13 where the transition metal loading is from 10 to 80 micromoles transition metal per gram of solid support.
- 19. (Previously Presented) The catalyst system of claim 13 where the transition metal loading is from 20 to 80 micromoles transition metal per gram of solid support.
- 20. (Previously Presented) The catalyst system of claim 13 where the transition metal loading is from 40 to 60 micromoles transition metal per gram of solid support.

Claims 21 to 29 cancelled.

30. (Previously Presented) The catalyst system of claim 17 wherein  $\text{LMX}_r$  has a square planar geometry.

Claims 31 -32 cancelled.

33. (Previously Presented) The catalyst system of claim 17 wherein the solid support comprises silica.

34. Cancelled

35. (Previously Presented) The catalyst system of claim 17 wherein M is a first row transition metal.

36. (Previously Presented) The catalyst system of claim 17 wherein A comprises at least one conjugated group.

37. Cancelled.

38. Cancelled.

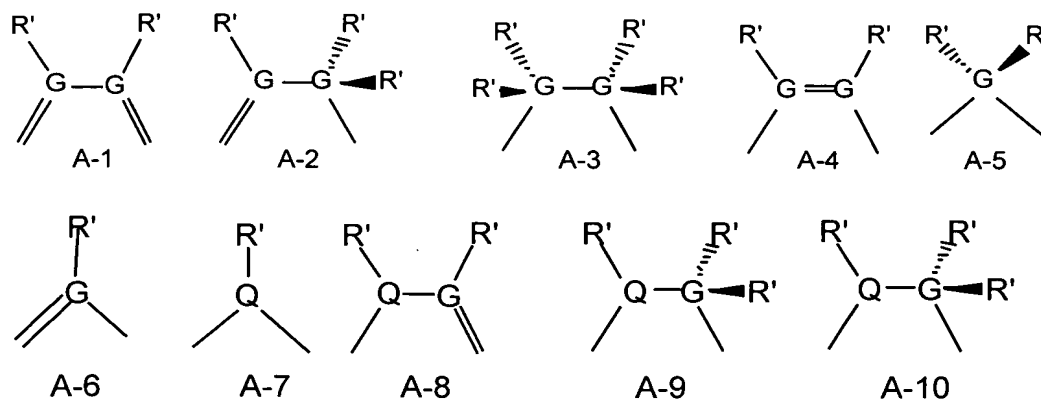
39. (Previously Presented) The catalyst of claim 17 wherein the activator comprises an alumoxane and the transition metal compound-to-alumoxane molar ratio is from 1:500 to 10:1.

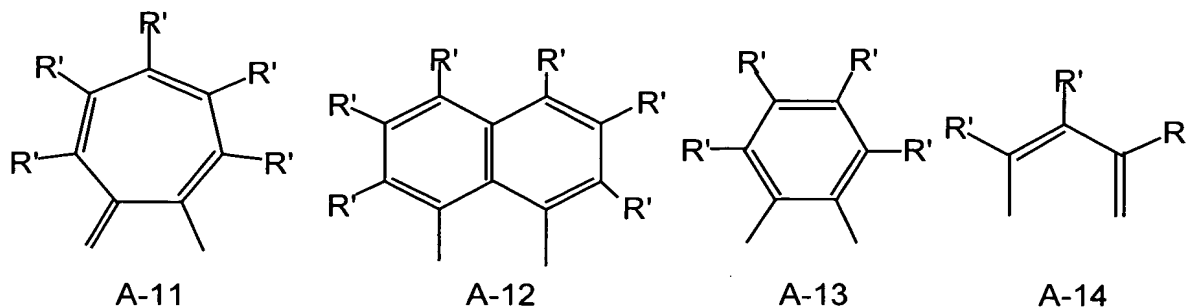
40. (Previously Presented) The catalyst system of claim 13 wherein M is Ni.

41. (Previously Presented) The catalyst system of claim 13, wherein the activator comprises methylalumoxane and/or modified methylalumoxane.

42. (Previously Presented) The catalyst system of claim 13, wherein the activator comprises a non-coordinating anion precursor and the total transition metal compound to noncoordinating anion precursor mole ratio is from 10:1 to 1:10.

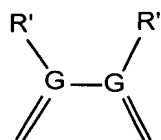
43. (Previously Presented) The catalyst system of claim 13 wherein the activator comprises a non-coordinating anion.
44. (Previously Presented) The catalyst system of claim 43 wherein M comprises one or more of Ni, Pd, Pt, Cu, or Co.
45. (Previously Presented) The catalyst system of claim 44 wherein the transition metal compound-to-noncoordinating-anion molar ratio is from 10:1 to 1:10.
46. (Previously Presented) The catalyst system of claim 43 wherein A has at least one conjugated group.
47. (Previously Presented) The catalyst system of claim 43 wherein the transition metal is present on the support at less than 80 micromoles transition metal per gram of solid support.
48. (Previously Presented) The catalyst system of claim 43 wherein M is nickel.
49. (Previously Presented) The catalyst system of claim 43 wherein A is defined by the following formulae:





wherein G is a Group 14 element; Q is a Group 13 element; and R' are independently hydride radicals, C<sub>1</sub>-C<sub>30</sub> hydrocarbyl radicals, substituted hydrocarbyl radicals, halocarbyl radicals, substituted halocarbyl radicals, or hydrocarbyl- or halocarbyl-substituted organometalloid radicals, and optionally two or more adjacent R' form one or more C<sub>4</sub> to C<sub>40</sub> rings to give a saturated or unsaturated cyclic or polycyclic ring.

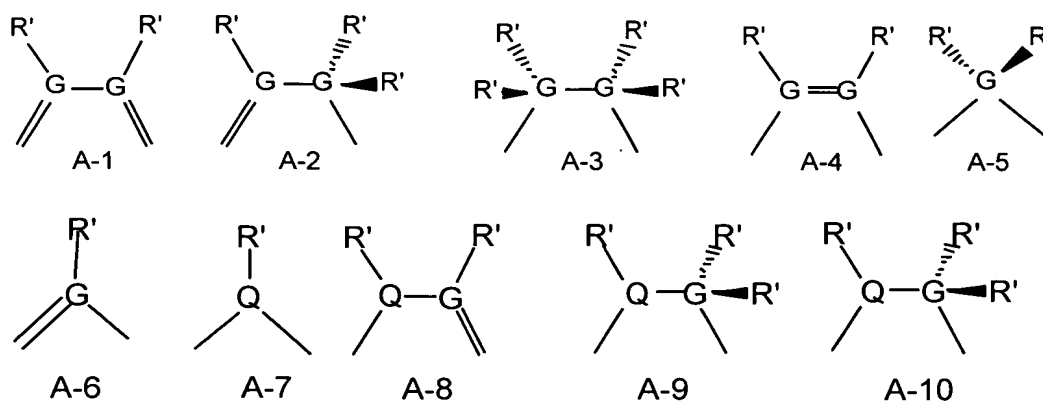
50. (Previously Presented) The catalyst system of claim 43 wherein M is nickel, E is nitrogen, m is 1, n is 1, p is 0, A is defined by the formula:

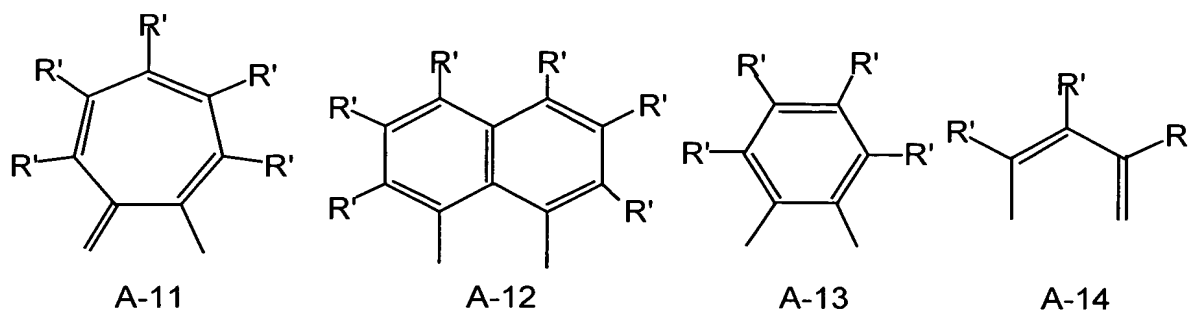


where each G is, independently, C, Si, or Ge, and each R' is a substituted phenyl group.

51. (Previously Presented) The catalyst system of claim 13 wherein the activator comprises an alumoxane.
52. (Previously Presented) The catalyst system of claim 51 wherein M is one or more of Ni, Pd, Pt, Cu or Co.
53. (Previously Presented) The catalyst system of claim 51 wherein the alumoxane comprises a modified alumoxane.

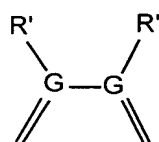
54. (Previously Presented) The catalyst system of claim 51 wherein the support comprises silica.
55. (Previously Presented) The catalyst system of claim 51 wherein the alumoxane comprises methylalumoxane.
56. (Previously Presented) The catalyst system of claim 51 wherein the alumoxane comprises modified methylalumoxane
57. (Previously Presented) The catalyst system of claim 51 wherein the alumoxane comprises an alkyl alumoxane.
58. (Previously Presented) The catalyst system of claim 51 wherein A has at least one conjugated group.
59. (Previously Presented) The catalyst system of claim 52 wherein the transition metal compound-to-alumoxane molar ratio is from 1:500 to 10:1.
60. (Previously Presented) The catalyst system of claim 51 wherein M is nickel.
61. (Previously Presented) The catalyst system of claim 51 wherein A is defined by the following formulae:





wherein G is a Group 14 element; Q is a Group 13 element; and R' are independently hydride radicals, C<sub>1</sub>-C<sub>30</sub> hydrocarbyl radicals, substituted hydrocarbyl radicals, halocarbyl radicals, substituted halocarbyl radicals, or hydrocarbyl- or halocarbyl-substituted organometalloid radicals, and optionally two or more adjacent R' form one or more C<sub>4</sub> to C<sub>40</sub> rings to give a saturated or unsaturated cyclic or polycyclic ring.

62. (Previously Presented) The catalyst system of claim 51 wherein M is nickel, E is nitrogen, m is 1, n is 1, p is 0, A is defined by the formula:



where each G is, independently, C, Si, or Ge, and each R' is a substituted phenyl group.

63. (Previously Presented) The catalyst system of claim 13 wherein the system is essentially without residual solvent.
64. (Previously Presented) The catalyst system of claim 63 wherein the activator comprises a non-coordinating anion.
65. (Previously Presented) The catalyst system of claim 63 wherein the activator comprises an alumoxane.

66. (Previously Presented) The catalyst system of claim 63 wherein the support comprises silica.

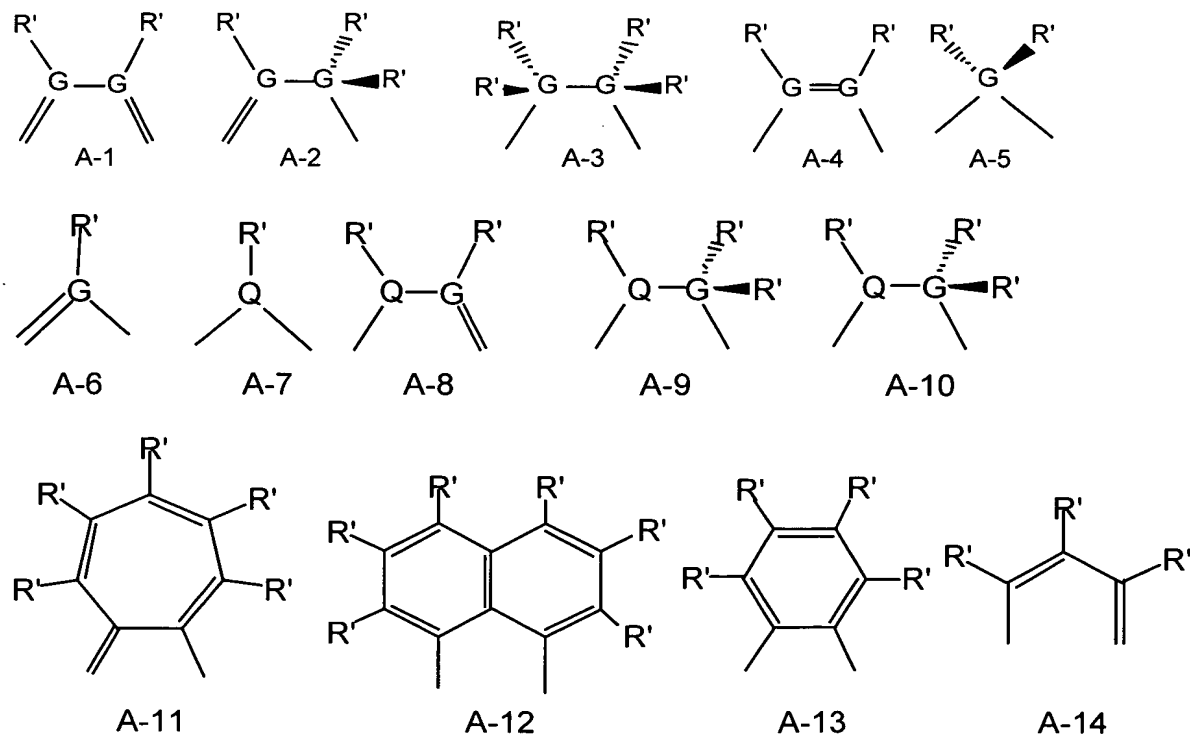
Claims 67- 69 cancelled.

70. (Previously Presented) The catalyst system of claim 63 wherein A has at least one conjugated group.

71. (Previously Presented) The catalyst system of claim 65 wherein the transition metal compound-to-alumoxane molar ratio is from 1:500 to 10:1.

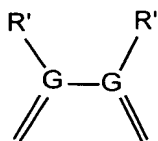
72. (Previously Presented) The catalyst system of claim 63 wherein M is nickel.

73. (Previously Presented) The catalyst system of claim 63 wherein A is defined by the following formulae:



wherein G is a Group 14 element; Q is a Group 13 element; and R' are independently hydride radicals, C<sub>1</sub>-C<sub>30</sub> hydrocarbyl radicals, substituted hydrocarbyl radicals, halocarbyl radicals, substituted halocarbyl radicals, or hydrocarbyl- or halocarbyl-substituted organometalloid radicals, and optionally two or more adjacent R' form one or more C<sub>4</sub> to C<sub>40</sub> rings to give a saturated or unsaturated cyclic or polycyclic ring.

74. (Previously Presented) The catalyst system of claim 63 wherein M is nickel, E is nitrogen, m is 1, n is 1, p is 0, A is defined by the formula:



where each G is, independently, C, Si, or Ge, and each R' is a substituted phenyl group.

Claims 75 to 98 cancelled.

99. (Previously Presented) A catalyst system comprising the combination of the catalyst compound of claim 13 and tetrakis(perfluorophenyl)boron as the activator.

100. Cancelled.

101. Cancelled.

102. Cancelled.

103. (Previously Presented) The catalyst system of claim 13 wherein the activator comprises a Group 13, 14, or 16 halide salt.

104. (Previously Presented) The catalyst system of claim 13 wherein the activator comprises a group 15 oxyfluoride salt.
105. (Previously Presented) The catalyst system of claim 13 wherein the activator comprises  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{TeOF}_6^-$  and/or  $\text{AsF}_6^-$ .
106. (Previously Presented) The catalyst system of claim 13 wherein the support comprises a non-coordinating anion chemically bound to the support.
107. (Previously Presented) The catalyst system of claim 13 wherein the support comprises a polymeric support.
108. (Previously Presented) The catalyst system of claim 13 wherein the support comprises one or more Group 2, 3, 4, 5, 13, or 14 metal or metalloid oxides.
109. (Previously Presented) The catalyst system of claim 13 wherein the support comprises one or more of magnesia, titania, or zirconia.
110. (Previously Presented) The catalyst system of claim 13 wherein the support has a pore size of from 10 to 1000 Å.
111. (Previously Presented) The catalyst system of claim 13 wherein the support has a surface area of 10-700 m<sup>2</sup>/g.
112. (Previously Presented) The catalyst system of claim 13 wherein the support has a pore volume of 0.1 to 4 cc/g.
113. (Previously Presented) The catalyst system of claim 13 wherein the support has an average particle size of 10-500 μm.

114. (Previously Presented) The catalyst system of claim 13 wherein the support has:
- a) a surface area of 50 to 500 m<sup>2</sup>/g;
  - b) a pore volume of 0.5 to 3.5 cc/g;
  - c) an average particle size of 20 to 200 μm; and
  - d) a pore size of 50 to 500Å.
115. (Previously Presented) The catalyst system of claim 114 wherein the transition metal compound is present on the support at a loading of 10-100 micromoles transition metal per gram of support.
116. (Previously Presented) The catalyst system of claim 115 wherein the loading is 20 to 80 micromoles transition metal per gram of support.
117. (Previously Presented) The catalyst system of claim 115 wherein the loading is 40 to 60 micromoles transition metal per gram of support..
118. Cancelled.
119. Cancelled.
120. Cancelled.